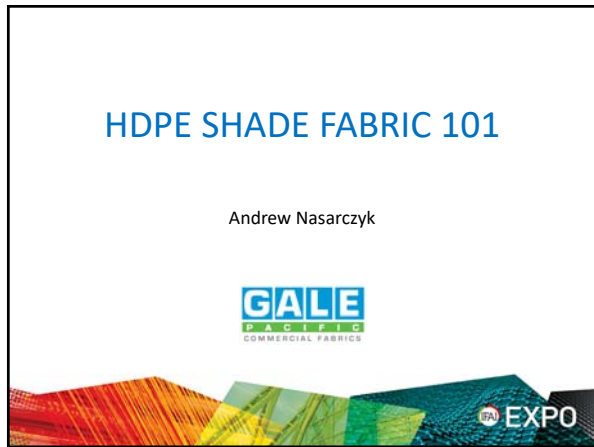
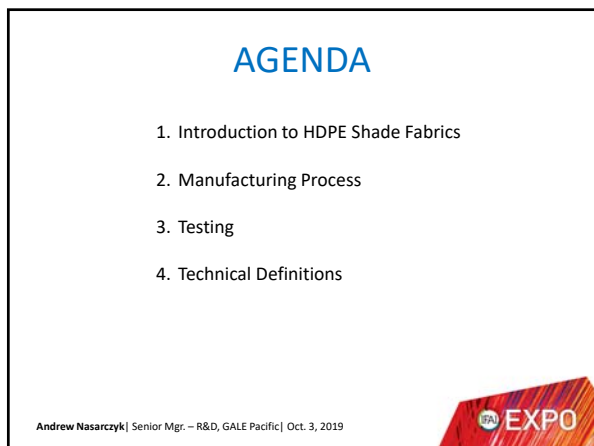




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Introduction to Shade










Nature
Linen
Cotton


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Introduction to HDPE Shade





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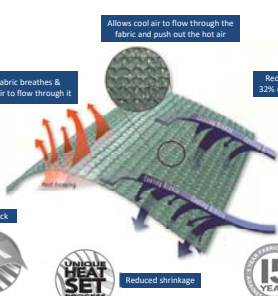
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HDPE Knitted Fabric

The fabric breathes & allows air to flow through it

Fabric resists tearing, fraying, mold & mildew

Up to 98% UV block



Allows cool air to flow through the fabric and push out the hot air

Reduces temperatures by up to 32% compared with direct sunlight

Simply hose clean

UV stabilized

Reduced shrinkage


Up to 15 year warranty against UV degradation depending on tier

Simply hose clean

UV stabilized

Up to 15 year warranty against UV degradation depending on tier

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HDPE

- Knitted Shadecloth is manufactured from a base polymer called HDPE
- HDPE = High Density PolyEthylene
- High strength, good UV resistance, and good chemical resistance
- Commonly used in pipes, bottles, membranes, film
- HDPE is Recyclable

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HDPE

- 100's of Grades of HDPE are available Globally
- Up to 95% of the base fiber component can be HDPE
- Selection of HDPE will impact:
 - Fiber Tenacity
 - Fiber Stiffness
 - Fiber Shrinkage
 - Fabric Durability

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Masterbatch

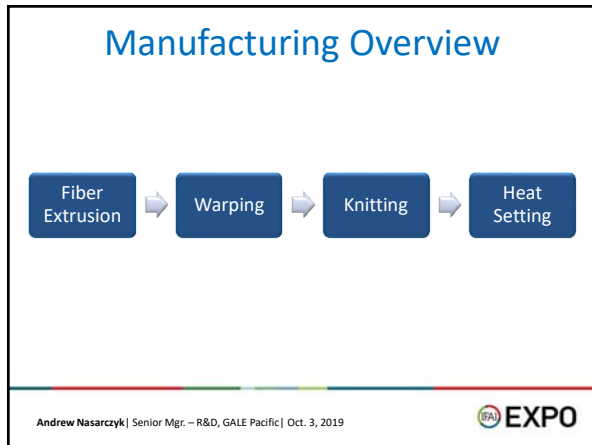
- Masterbatch is added to HDPE to boost aesthetics and performance
- Masterbatch is normally custom manufactured
- Additives within the Masterbatch will dictate:
 - UV Life
 - Color
 - Colorfastness
 - Processing
 - Functionality such as FR

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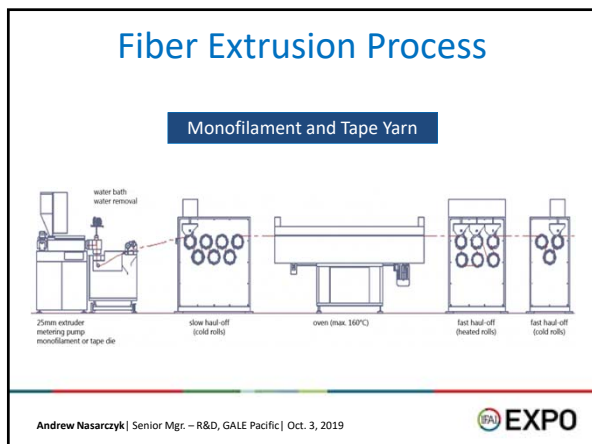
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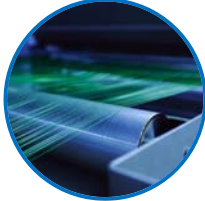
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Fiber Manufacturing


Monofilament



Tape Yarn



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Manufacturing Monofilament Yarn











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Manufacturing Tape Yarn











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Monofilament vs Tape Fiber


	Monofilament	Tape
Advantages	<ul style="list-style-type: none"> ○ High Strength to Weight Ratio ○ Better UV Durability ○ More Stable Loop During Knitting Process (Lower Stretch Under Tension) ○ Less Susceptible to Damage During Fabrication 	<ul style="list-style-type: none"> ○ High Strength to Weight Ratio ○ More Efficient Coverage – Better Blocking for Lower Weight ○ Softer – Easier to Handle/Fabricate
Disadvantages	<ul style="list-style-type: none"> ○ Poor UV Coverage ○ Stiffer Fabric/More Abrasive ○ Creasing in Knitted Fabric More Prevalent 	<ul style="list-style-type: none"> ○ Higher Stretch Under Tension ○ Lower UV Durability ○ Fibers Can be More Easily Damaged Through Sewing

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Warping

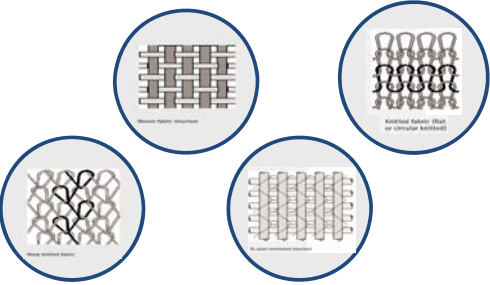
- Commonly by-passed as a process in warp knitting
- Converts yarn from individual bobbins onto a common beam
- Precise warping leads to:
 - Superior Yarn Tension Consistency (Aesthetics)
 - Minimal Yarn Breaks (Stop Marks)



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Conventional Textile Structures




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Knitting

- All knitted shade cloth products are knitted using a technique called “warp knitting”
- It is different to the knitting used to make products such as socks/apparel/jumpers, which are typically made using a “weft knitting” process
- The different yarn types can give different properties
- Fabric construction and yarn selection is important as it can influence aesthetics, strength and shading properties




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Knitting

- Each fabric is characterized by having a warp and weft direction
- The warp direction refers to machine direction (ie: the direction in which the fabric is being produced) – also referred to as a WALE
- The weft direction (or “fill”) is the crosswise direction – and can also be described as a COURSE




↑ Machine direction

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Knitting



The Formation of Stitch During Warp Knitting Process

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Knitting




How it Happens in a Production Environment


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Stentering/Heat Setting

- Stentering/Heat setting is an important finishing process for a knitted fabric
- Key benefits include:
 - Removing the inherent curl/stress within a knitted fabric
 - Pre – shrinking fabric to provide better dimensional stability
 - Compacting knitted loops – better dimensional stability
 - Removing creasing



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Testing






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Common Testing Parameters

Fabric Weight	Tensile Strength
Tear Resistance	Burst Force
Biaxial Stability	Flame Retardancy


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Fabric Weight

- Fabric mass refers to the total weight of the knitted fabric
- It is typically measured in ounces per square yard (oz/yd²) or grams per square meter (gsm)
- A common method to measure fabric mass is to use a disc of fabric exactly 0.01 sqm is cut and weighed on an analytical balance



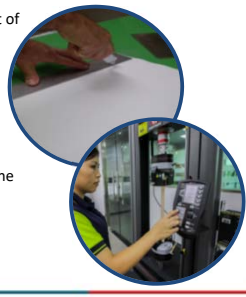
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Tensile Strength

- Tensile strength is a basic measurement of material strength. It measures the maximum amount of force that can be applied to a fabric before it breaks.
- The test is conducted using a Tensile Testing Machine
- The elongation at break can also be recorded (unit: %). This is the amount the material has stretched at the point of break.



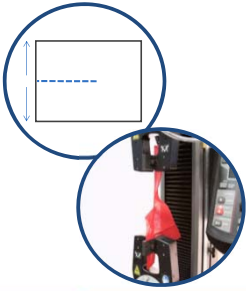
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Tear Resistance

- Tear strength measures how resistant a fabric is to tearing. It measures the force required to continue a tear once it has been formed.
- A test specimen is cut part way along its length so as to form two wings. The wings are gripped in the jaws of the testing machine.
- The force required to propagate a tear in the fabric is measured




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Burst Force

- Burst force is a test that gives indication of fabric strength
- A sample is clamped in a ring clamp and a steel ball is used to exert a downward force on the fabric
- The force at which the fabric breaks is recorded as the burst force



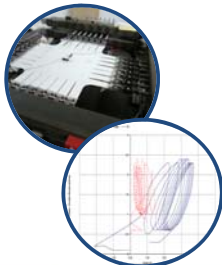
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Biaxial Stability

- Biaxial testing allows the fabric's response to be investigated under different load conditions in warp and weft directions simultaneously in response to the stress conditions
- This information assists in analyzing the initial behavior at installation, prestress behavior and long-term behavior



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Flame Retardant Performance

- There are many different methods of testing flammability of products – these will vary in terms of type of flame, duration of flame application to fabric and actual measurements taken during testing (eg: length of damage, after flame time, smoke developed, heat developed etc.)
- The method used differs depending on the applications and most regions/industries will have their own specific testing requirements



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Technical Definitions

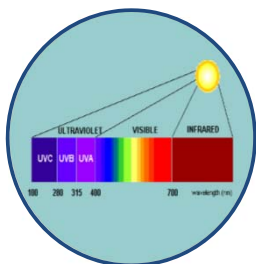


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UV Radiation



Understanding Sunlight




Wavelengths of Sunlight Impacting Earth

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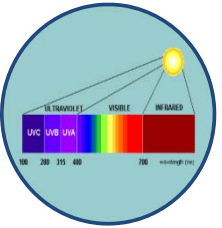
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UV Block




UV Block

- Sunburn
- Damaged Skin
- Cataracts
- Premature Aging
- Skin Cancer



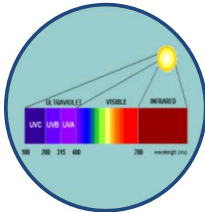
- UVR (range 290 to 400 nm)
- UVR Block – AVERAGE % Block Over the Broad UVA and UVB Spectrum

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Cover Factor and Shade Factor



What is Cover Factor?


- The UV radiation (350nm) transmitted through a specimen of shade fabric is measured



What is Shade Factor?

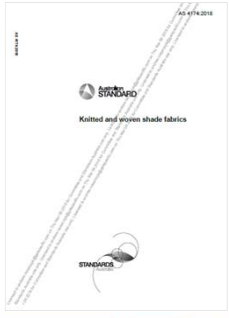
- Shade Factor is essentially a measure of the amount of visible light REFLECTED or ABSORBED through the shade cloth
- Darker colors have a HIGHER Shade Factor than Lighter Colors


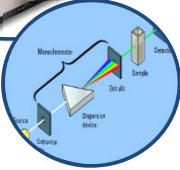
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Testing UV Block / Cover Factor



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